

Case-control study of the association between the use of cellular and cordless telephones and malignant brain tumors diagnosed during 2000-2003

**Environmental Research
Volume 100, Issue 2, February 2006, Pages 232-241**

Lennart Hardell, Michael Carlberg and Kjell Hansson Mild,
FROM ABSTRACT:

We performed a case-control study on the use of cellular and cordless telephones and the risk for brain tumors. We report the results for malignant brain tumors with data from 317 cases and 692 controls.

The use of analog cellular phones increased the risk of malignant brain tumors **160%** with a range between **50% to 330%**.

This rose to **250%** increased risk with more than **10 years** of use, with a range between **100% to 540%**.

The use of digital cellular telephones increased the risk of malignant brain tumors **90%** with a range between **30% to 170%**.

This rose to **260%** increased risk with more than **10 years** of use, with a range between **70% to 650%**.

The use of cordless telephones increased the risk of malignant brain tumors **110%** with a range between **40% to 200%**.

This rose to **190%** increased risk with more than **10 years** of use, with a range between **60% to 420%**. [This is your around-the-house desktop cordless phone]

The increased risk rose with the cumulative number of hours of use and was highest for high-grade astrocytoma.

In multivariate analysis, all three phone types studied showed an increased risk [of malignant brain tumors].

Increased Risk of Malignant Brain Tumors From Using Wireless Phones

Type Of Phone	Overall Increased Risk	Overall Increased Risk Range	Increased Risk with 10 years Use	Increased Risk with 10 years Use Range
Current Digital Cell Phone 1991-present	90%	30% - 170%	260%	70% - 650%
Older Analog Cell Phone 1984-2000	160%	50% - 330%	250%	100% - 540%
Household Cordless Phone	110%	40% - 200%	190%	60% - 420%

Analog cell phone use for more than **15 years** increased the risk of malignant brain tumor to **510%** with a range between **150% to 1,400%**.

THESE AUTHORS ALSO NOTE:

"In previous epidemiological studies we found an association between the use of cellular telephones and brain tumors."

In epidemiological studies the assessment of microwave exposure is usually based on the type of phone:

- 1) Nordic Mobile Telephone System (NMT) [analog]
- 2) Global System for Mobile Communication (GSM) [digital]
- 3) Cordless Telephone [home or office walk-around phone]

and the years and cumulative numbers of hours of use because there is variation in the specific absorption rate (SAR) of the different types of cellular telephones

"During cellular phone calls, radio frequency (RF) signals in the range of 400–2000 MHz are used."

In Sweden, the NMT portable analog phones became available in 1984, used 900-MHz, and were popular between 1986 and 2000.

In Sweden, the digital GSM system started in 1991 and has been the most common phone since the end of the 1990s.

In Sweden, desktop cordless telephones have been used since 1988. At first, the analog range of 800–900 MHz RF was used, but now usually digital cordless telephones that operate at 1900 MHz are used.

As compared to similar studies, this study used a longer follow-up period of users, especially of digital cellular telephones.

The mean numbers of daily calls and minutes were used to calculate the cumulative use in hours from the first year of use up to the year before diagnosis.

"Use of a cellular telephone in a car with a fixed external antenna was disregarded. Similarly, the use of a hands-free device with an earpiece was excluded in the calculation of the total number of hours."

"We also assessed information on the ear most frequently used during calls with cellular and cordless telephones over the years or whether both ears were used equally."

"The use of cordless telephones also gave a significantly increased risk [of malignant brain tumors], the highest being with a greater than 10-year latency time at 190% increased risk with a range between 60% - 420%."

"Regarding different types of malignant brain tumors, the highest risk was found for high-grade astrocytoma."

"An increased risk was found for tumors located in the temporal, frontal, or other parts of the brain."

In general, the highest risk for malignant brain tumors was found for ipsilateral use, but an increased risk was also found for contralateral phone use.

"The analysis of high-grade astrocytoma yielded a significantly increased risk for analog and digital cellular telephones with a >10-year latency period. Also, cordless phones increased the risk, although not significantly."

The risk for all malignant brain tumors and for high-grade astrocytoma increased rather dramatically for those who used combinations of these wireless phones (like using both a cell phone and a walk-around-the-house cordless phone).

DISCUSSION

"We have in two previous studies found an increased risk for brain tumors associated with the use of cellular telephones."

"The risk was highest on the same side of the brain as the cellular phone had been used."

"Regarding malignant brain tumors with ipsilateral localization, significantly increased risk was found for high-grade astrocytoma for analog and digital cellular telephones and cordless phones."

In this study, deceased subjects were excluded from the analysis; because in this study 187 patients with a malignant brain tumor were deceased (most of them had high-grade astrocytoma), the overall risk of malignant brain tumors in this study was low, or "diluted." **[Important]**

"Our main finding was a significantly increased risk for high-grade astrocytoma for all three studied phone types." **[Important]**

- 1) Analog Phones
- 2) Digital Cellular Phones
- 3) Cordless Phones

"The median latency period for all malignant brain tumors was for analog phones 12 years, for digital cellular phones 5 years, and for cordless phones 6 years."

These "results are of relevance as to carcinogenesis, and this is so far the first study with the possibility of investigating the risk among long-term users."

The risk for brain malignancy was “highest for ipsilateral exposure.”
However, “contralateral use of the phone gives some exposure to the tumor area.”

“In the multivariate analysis, analog and digital cellular as well as cordless phones were independent risk factors for malignant brain tumors.”

“The risk was significantly increased for subjects who had used digital cellular or cordless phones only.”

Regarding cordless home phone, note:

- 1) Cordless telephones have lower power output than digital cell phones.
- 2) However, digital cell phones regulate the output power depending on the quality of transmission, and in the city of Stockholm they average using only 4% of their maximum output power. [In rural areas, the average output power is much higher].
- 3) Also, digital cell phones transmit with 217 pulses per second when one is talking but with only 2 pulses per second when listening. [More pulses cause a deeper penetration into the brain].
- 4) Therefore, most digital cell phones have a median power of 10–20 MW, which is the same order of magnitude as cordless phones.
- 5) Because longer calling times are common with cordless telephones, the “dose’ for cordless users is then even higher” than that for digital cell phone users.

[Very Important]

“In summary our study showed an increased risk for malignant brain tumors associated with the use of analog and digital cellular telephones and cordless phones.”

“The risk was highest for the most malignant brain tumors, high-grade astrocytoma.”

“The risk increased with both the latency period and the number of hours used for phone calls.”

KEY POINTS FROM DAN MURPHY

- 1) This is the longest study to date on the malignant brain tumor risk from using wireless phones, both cell phones and cordless home phones.
- 2) This is not the first epidemiological study to find a significant association between the use of cellular telephones and brain tumors.
- 3) The risk of malignant brain tumors (primarily high-grade astrocytomas) increases with the longer the use of wireless phones.
- 4) The risk for all malignant brain tumors increased rather dramatically for those who used combinations of a cell phone and a walk-around cordless phone.

Increased Risk of Malignant Brain Tumors From Using Wireless Phones

Type Of Phone	Overall Increased Risk	Overall Increased Risk Range	Increased Risk with 10 years Use	Increased Risk with 10 years Use Range
Current Digital Cell Phone 1991-present	90%	30% - 170%	260%	70% - 650%
Older Analog Cell Phone 1984-2000	160%	50% - 330%	250%	100% - 540%
Household Cordless Phone	110%	40% - 200%	190%	60% - 420%

5) Analog cell phone use for more than **15 years** increased the risk of malignant brain tumor to **510%** with a range between **150% to 1,400%**.

6) The incidence of malignant brain tumors found in this study is low because those that died of malignant brain tumors were not counted. They were only counted if they were still living.

7) For a variety of reasons, the microwave radiation dose was higher for cordless home phone users than for digital cellular phone users, making these devices even more dangerous.

IMPORTANT QUESTIONS:

Do you use a cell phone?

For how many years have you been using a cell phone?

Do you use a headset (or other attenuating device) with your cell phone?

Do you use a walk-around-the-house cordless phone?

For how many years have you been using a walk-around-the-house cordless phone?

Are you currently using both a cell phone and a walk-around-the-house cordless phone?